REMARKS

I. Status of the Claims

Claims 1-8 are pending.

Claims 1-8 stand rejected.

Claims 1-8 have been amended. No new matter has been added.

II. Claim Objections

The Examiner has objected to claims 1 and 4 because of a number of informalities.

In response, claims 1 and 4 have been amended to correct the informalities as suggested by the Examiner. Accordingly, withdrawal of this objection is respectfully requested.

III. Rejection under 35 U.S.C. 112

The Examiner has rejected claims 2 and 8 under 35 U.S.C § 112, first paragraph, as containing subject matter which was not described in the specification because the symbol "i" used in the equation in claim 2 is not described in the specification. This rejection is respectfully traversed.

The symbol "i" designates the imaginary quantity of a complex number. Such an imaginary quantity is usually designated by the symbol "i" or "j." The present specification, as originally filed, chooses symbol "i" as it appears in all the equations of the specification (page 5, line 31; page 10; page 11). It would be clear to one of ordinary skill in the art reading Maxwell equations that symbol "i" designates an imaginary quantity. Accordingly, claim 2 complies with

the requirement of 35 U.S.C. § 112, first paragraph, and withdrawal of this rejection is respectfully requested.

Claim 8 depends from claim 2. Thus, claim 8 also meets the requirement of 35 U.S.C. § 112, first paragraph, with respect to the use of the symbol "i" in claim 2. Accordingly, withdrawal of this rejection is respectfully requested.

The Examiner also rejected claims 1-4 and 8 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. More particularly, the Examiner stated that the language "current, respectively voltage" and "voltage, respectively the current" claimed in independent claims 1 and 4 is unclear as to what limitations are actually being claimed.

In response, independent claims 1 and 4 have been amended to clarify how the electromagnetic brake is being powered. Claim 1 has been amended to recite:

> supplying the electromagnetic brake with electrical power from at least one constant power source, wherein one of current and voltage of the constant power source's output is held constant; measuring the other of the current and voltage of the constant power source; and extracting the flow speed of the liquid molten metal from variations in the measurement.

Claim 4 has been amended to recite:

> supplying each of the several inductors with electrical power from at least one constant power source, wherein one of current and voltage of the constant power source's output is held constant; controlling the other of the current and voltage of the constant power source with a measurement of the other of the current and voltage in each inductor.

No new matter has been added by these amendments. Support for claims 1 and 4, as amended, can be found, for example, on page 13, line 32 through page 14, line11 and page 14, lines 20-24

of the specification as originally filed. Amended independent claims 1 and 4, and claims 2, 3, and 8 depending therefrom, comply with the requirements of 35 U.S.C. § 112, second paragraph.

Accordingly, withdrawal of the rejection of claims 1-4, and 8 under 35 U.S.C. § 112, second paragraph, is respectfully requested.

IV. Rejection Under 35 U.S.C. 102

The Examiner has rejected claims 5-7 under 35 U.S.C § 102 as being anticipated by United States Patent No. 5,307,863 to Kubota *et al.* ("Kubota"). This rejection is respectfully traversed.

Nevertheless, independent claim 5 has been amended to clarify those claimed features that are distinguishable from Kubota. As amended, claim 5 recites:

> at least one inductor included in the electromagnetic brake;
> each inductor powered by an individual supply circuit; and the installation includes means for regulating at least one of supply voltage and current of each inductor independent of other inductors to maintain the liquid metal flow speeds balanced between the two ports. (Emphasis added.)

As claimed, each inductor of the electromagnetic brake of the invention is powered by an individual supply circuit. Because the inductors are powered independent of one another, the liquid metal flow speeds between the two nozzle ports can be balanced and maintained by regulating either the supply voltage or the supply current of each inductor. No new matter has been added by this amendment. The support for claim 5, as amended, can be found, for example, on page 13, line 1 through page 14, line 24, and Figure 4 of the specification as originally filed.

In contrast, Kubota does not show or suggest independently powering the inductors of an electromagnetic brake. Accordingly, withdrawal of this rejection and allowance of independent claim 5 and claims 6 and 7, depending therefrom, are respectfully requested.

V. Rejection Under 35 U.S.C. 103

The Examiner has rejected claims 1-4 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Kubota. More particularly, the Examiner states that Kubota discloses the apparatus claim limitations set forth in claims 5-7 and it would have been obvious to one of ordinary skill in the art to conduct the method recited in claim 1 using that apparatus. This rejection is respectfully traversed.

As discussed above in reference to the Examiner's rejection of claims 5-7 under 35 U.S.C. § 102, Kobota does not disclose the apparatus claim limitations set forth in claims 5-7, as amended. Furthermore, independent claim 1, as amended, recites a method for measuring the flow speed of a liquid molten metal that requires:

> supplying the electromagnetic brake with electrical power from at least one constant power source, wherein one of current and voltage of the constant power source's output is held constant;
> measuring the other of current and voltage of the constant power source; and
> extracting the flow speed of the liquid molten metal from variations in the measurement.

Thus, the method of independent claim 1 requires measuring the flow speed of the molten metal by monitoring the parameters (current or voltage) of the electrical power supplied to the electromagnetic brake's inductors in order to determine the flow speed of the molten metal.

In contrast, Kubota discloses that a separate molten metal sensor 17 is used to monitor the effect of depressing the movement of the wave of the molten steel surface generated by the magnetic field generator 18. (*See* Kubota, column 10, lines 29-34). Thus, Kubota does not disclose, teach, or suggest to one of ordinary skill in the art to supply the electromagnetic brake with electrical power from at least one constant power source, wherein one of current and

voltage of the constant power source's output is held constant, and measuring the other of current and voltage of the constant power source to extract the flow speed of the molten liquid metal

Accordingly, withdrawal of the rejection of independent claim 1, as amended, and claims 2 and 3, depending therefrom, and their allowance are respectfully requested.

Independent claim 4, as amended, recites:

> a method for regulating the continuous casting speed of a molten metal in an ingot mould equipped with a sliding field electromagnetic brake including several inductors, the method comprising:
>
> supplying to each of the several inductors with electrical power from at least one constant power source individually, wherein one of current and voltage of the constant power source's output is held constant; and
>
> controlling the other of the current and voltage of the constant power source with a measurement of the other of the current and voltage in each inductor.

Thus, the method of independent claim 4 requires measuring the flow speed of the molten metal by monitoring the parameters (current or voltage) of the electrical power supplied to the electromagnetic brake's inductors in order to determine the flow speed of the molten metal.

In contrast, Kubota discloses that a separate molten metal sensor 17 is used to monitor the effect of depressing the movement of the wave of the molten steel surface generated by the magnetic field generator 18. (*See* Kubota, column 10, lines 29-34). Thus, Kubota does not disclose, teach, or suggest to one of ordinary skill in the art to supply the electromagnetic brake with electrical power at least one constant power source, wherein one of current and voltage of the constant power source's output is held constant, and measuring the other of the current and voltage of the constant power source to extract the flow speed of the molten liquid metal.

Accordingly, withdrawal of the rejection of independent claim 4, as amended, and claim 8, depending therefrom, and their allowance are respectfully requested.

In addition to the amendments discussed above, claims 1-8 have been further amended to modify some stylistic aspects of the claims. No new matter has been added by these amendments.

VI. Summary

Applicant believes that all the Examiner's objections and the rejections have been addressed and overcome. Applicant has shown that the reference cited, Kubota, neither anticipates nor render obvious the invention claimed. Accordingly, reconsideration, withdrawal of the objections and rejections and allowance of the claims are respectfully requested.

If the Examiner believes the prosecution of this application would be advanced by a telephone call, the Examiner is invited to contact the applicant's attorney at the telephone number indicated below.

No fees are believed required for the filing of this Amendment and Response.

Respectfully submitted,

Date: 6-27-03 By: _____

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APPENDIX

MARKED UP VERSION OF THE CLAIMS SHOWING AMENDMENTS

The following marked-up abstract and claims correspond to the replacement abstract and claims of this amendment.

THE ABSTRACT:

A method for measuring flow speed of a liquid molten metal in an ingot mould equipped with a sliding field electromagnetic brake, consisting of measuring the voltage or the current of at least one power source for the electromagnetic brake and extracting the flow speed from this measurement.

IN THE CLAIMS:

1. (Amended) A method for measuring the flow speed of a liquid molten metal [(l)] in an ingot mould [(1)] equipped with a sliding field electromagnetic brake, [characterized in that it consists of] comprising:

supplying the electromagnetic brake with [current, respectively voltage,] electrical power from at least one constant power source, wherein one of current and voltage of the constant power source's output is held constant;

measuring the other of the current and voltage[, respectively the current,] of the constant power source [(31, 32)]; and

extracting the flow speed of the liquid molten metal from [the] variations [of this] in the measurement.

2. (Amended) The method of claim 1, [applied to an] wherein the electromagnetic brake having at least one inductor [(9) of] which includes two packs [(16, 17)] of several conductors in a vertical direction [(z), characterized in that it consists of], the method further comprising: applying, for each conductor, the following relation:

$$\text{grad}\mathbf{V} = -\mathbf{i}\,(\omega - \mathbf{vk})\,\mathbf{A} - \rho\mathbf{j},$$

where ω represents the A.C. excitation pulse of the sliding field, **v** represents the metal speed, **k** represents the wave number of the inductive sliding magnetic field, **A** represents the vector potential, ρ represents the resistivity of the metal, **j** represents the density of the excitation current of the conductor, and **V** represents the voltage across the inductor.

3. (Twice amended) The method of claim 1, [characterized in that] wherein the speed measurement is used to servocontrol the excitation of the inductors [(9)] into a predetermined value.

4. (Amended) A method for regulating the continuous casting speed of a molten metal in an ingot mould [(1)] equipped with a sliding field electromagnetic brake including several inductors, the method comprising [(9), characterized in that it consists of] :

supplying [the electromagnetic brake] each of the several inductors with [current, respectively voltage,] electrical power from at least one constant power source individually, wherein one of current and voltage of the constant power source's output is held constant; and

controlling the other of the current and voltage [or the current] of the constant power source [(31, 32)] with a measurement of the other of the current and [or of the] voltage in each inductor.

5. (Amended) A continuous casting installation of the type using a sliding field electromagnetic brake to control the flow of a liquid metal [(1)] provided by two ports [(4)] of a nozzle, comprising:

at least one inductor included in the electromagnetic brake;

[(3), characterized in that] each inductor [(9) of the electromagnetic brake is] powered by an individual supply circuit [(21)]; and [in that] the installation includes means [(26, 35, 36)] for regulating at least one of [the] supply voltage and [or] current of each inductor independent of other inductors to maintain the liquid metal flow speeds balanced between the two ports.

6. (Amended) The installation of claim 5, wherein [characterized in that] each supply circuit [(21)] of each inductor [(9)] includes its own means [(35, 36)] for regulating the electromagnetic excitation power of this inductor.

7. (Amended) The installation of claim 5, [characterized in that it includes] further comprising a central station [(26)] for controlling the supply circuits [(21)] of [the] different inductors [(9)] to regulate the liquid metal flow speed.

8. (Amended) The method of claim 2, wherein [characterized in that] the speed measured is used to servocontrol the excitation of the inductors [(9)] into a predetermined value.